Research, Development, and Assessment of Environmentally Compliant Coatings and Inhibitors for the Corrosion Protection of Military Assets

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This poster summarizes the capabilities within S.R. Taylor's laboratory for the research, development, and assessment of coatings and inhibitors for corrosion protection of metals. Much of this research has been specific to military aerospace alloys.

This laboratory conducts both basic and applied research. One objective is to understand the physical, chemical, and electrochemical phenomena that determine the protectiveness of a coating system or inhibitor. A second objective of our research effort is to develop a sensitive, short-term laboratory test that can reliably predict the service-life of a new coating system. Significant capabilities of this laboratory are:

1. Identification of Cr-free Corrosion Inhibitors:

This laboratory has developed high-throughput screening (HTS) methods to evaluate thousands of corrosion inhibitors for AA2024-T3 in a single day. Very promising Cr-free synergistic combinations have been identified. These materials can be used within paints, CPCs, cleaning solutions, etc. These HTS methods are being used to evaluate self-healing capabilities of new paint systems, as well as other testing applications.

2. Evaluation of Coating Systems:

This laboratory is very experienced in the evaluation of the barrier and adhesion properties of organic coatings. It has world-class capabilities in both global and local electrochemical impedance spectroscopy, and most other corrosion assessment methods. In addition, it has developed and successfully used molecular probe techniques to characterize the modes of ion entry and passage through polymer films. We have the capability to assess wet and dry-state adhesion of coatings, as well as cathodic disbonding characteristics.

3. Service-life Prediction of Coating Systems:

Recognizing that the performance of paint requires more than just good barrier properties, this laboratory has developed a 'damage tolerance test' to predict service-life of paint systems. This test can be performed in less than a week and can predict 3000 hour salt spray performance of new coating systems with accuracy.

4. Durability of Graphite Fiber–Polymer Matrix (GFPM) Composites

This laboratory was the first to assess the fiber-matrix durability of GFPM's in the presence of aqueous, galvanically coupled, and stressed environments. These test methods also been used to measure fatigue damage of GFPM materials that have been cycled to only 10% of their fatigue life.